University of Saskatchewan
Department of Electrical Engineering
EE 482.3 Power Electronics
Midterm Examination

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1. A half-wave controlled rectifier is shown in Figure 1. The thyristor, Q is fired at $\alpha = 45^{\circ}$ during each cycle. The rms value of the source voltage is 120 V. Consider $V_c = 24$ V, L = 12 mH and R= 6 Ω.

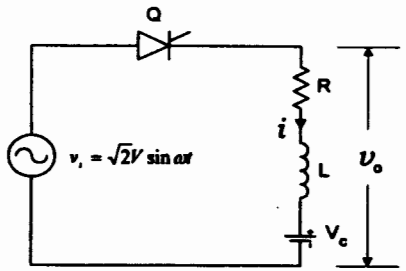

Figure 1: A Half-wave rectifier.

a) Sketch to scale the output voltage and the inductor current over one cycle.
b) Obtain a time dependent expression for the inductor current.
c) Find the average and rms values of the inductor current.
d) Find the maximum reverse voltage across the thyristor.
e) Find the peak value of the current through the thyristor.
f) Find the average and rms values of the output voltage.
g) Determine the power output of the converter.

2. A single-phase, full-wave, phase-controlled rectifier supplies an inductive load as shown in Figure 2. For V= 240 V, L = 11 mH, R = 3 Ω, V_c = 100 V and $\alpha = 35^{\circ}$; (a) sketch to scale the time variations of the output voltage, the transformer secondary current, the inductor current and the diode current. (b) Determine whether the load current is continuous or discontinuous. Calculate the (c) average and rms values of the in
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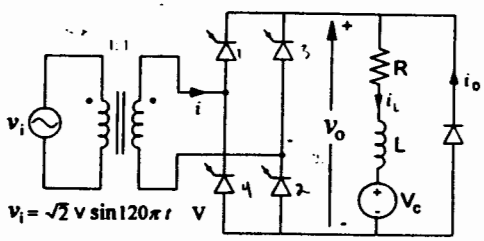

Figure 2: A full-wave controlled rectifier.

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